Transceiver Module
TCM 310 / 310C

February 23, 2011

Observe precautions! Electrostatic sensitive devices!

Patent protected:
WO98/36395, DE 100 25 561, DE 101 50 128,
WO 2004/051591, DE 103 01 678 A1, DE 10309334,
WO 04/109236, WO 05/096482, WO 02/095707,
US 6,747,573, US 7,019,241

REVISION HISTORY

The following major modifications and improvements have been made to the first version of this document:

No	Major Changes
1.00	Initial version

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Important!

This information describes the type of component and shall not be considered as assured characteristics. No responsibility is assumed for possible omissions or inaccuracies. Circuitry and specifications are subject to change without notice. For the latest product specifications, refer to the EnOcean website: http://www.enocean.com.
As far as patents or other rights of third parties are concerned, liability is only assumed for modules, not for the described applications, processes and circuits.
EnOcean does not assume responsibility for use of modules described and limits its liability to the replacement of modules determined to be defective due to workmanship. Devices or systems containing RF components must meet the essential requirements of the local legal authorities.
The modules must not be used in any relation with equipment that supports, directly or indirectly, human health or life or with applications that can result in danger for people, animals or real value.
Components of the modules are considered and should be disposed of as hazardous waste. Local government regulations are to be observed.
Packing: Please use the recycling operators known to you.

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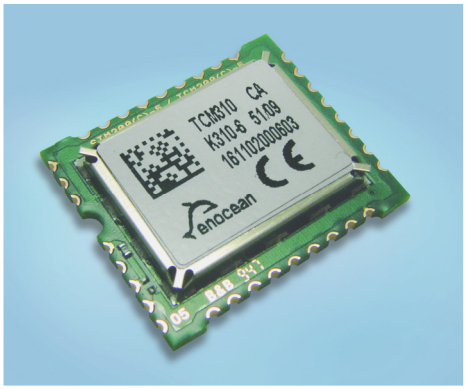
1 GENERAL DESCRIPTION

1.1 Basic functionality

TCM 310 enables the realization of gateways for the EnOcean 868 MHz and 315 MHz radio systems. It provides a bi-directional radio interface at one end and a bi-directional serial interface at the other end. Radio messages are sent transparently through the serial interface in both directions from and to an externally connected host processor or host PC. In addition control commands can be sent from the host, e.g. to configure the repeater functionality or to manage the Smart Ack functions. TCM 310 can act as postmaster for up to 15 bi-directional sensors using Smart Ack technology.



Features

- Smart Ack controller functionality
- Transparent radio channel
- Programmable repeater functionality (1 / 2 Level)
- ESP3 support (EnOcean Serial Protocol V3)
- Not API programmable!

Product variants

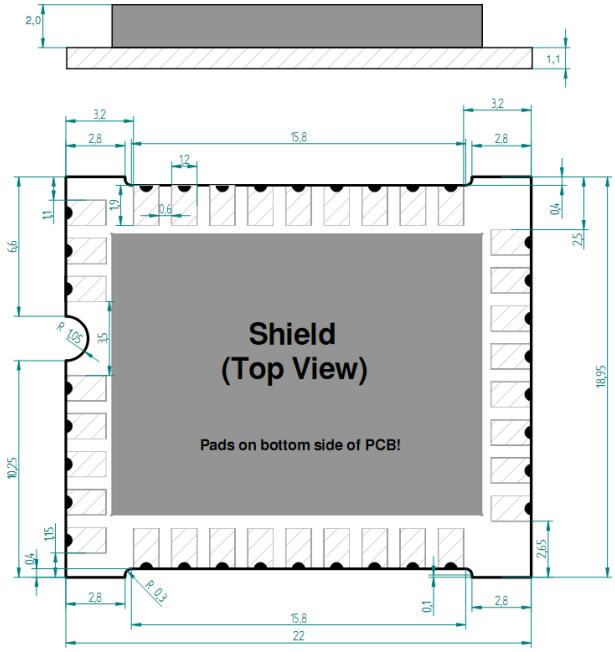
- TCM 310/310C: SMD mountable module for use with external antenna (868/315 MHz)

1.2 Technical data

Antenna	External whip or 50 Ω antenna mountable
Frequency	315.0 MHz (TCM 310C) / 868.3 MHz (TCM 310)
Radio Standard	EnOcean 868 MHz/315 MHz
Data rate/Modulation type	125 kbps/ASK
Receiver Sensitivity (at 25°C)	typ. –96 dBm[1] (868 MHz) typ. -98 dBm[1] (315 MHz)
Conducted Output Power	typ. 3 dBm
Power Supply	3V ± 5%
Serial Interface	UART
Current Consumption	Receive mode: typ. 33 mA, max. 43 mA (RX) Transmit mode: typ. 24 mA, max. 33 mA (TX)
Radio Regulations	R&TTE EN 300 220 (TCM 310) FCC CFR-47 Part 15 (TCM 310C)

[1] @ 0.1% telegram error rate (based on 3 transmitted sub-telegrams)

1.3 Physical dimensions



Unless otherwise specified dimensions are in mm.

Tolerances:
PCB outline dimensions ±0.2 mm
All other tolerances ±0.1 mm

TCM 310 / TCM 310C (pads on bottom side of PCB!)

PCB Dimension	22 x 19 x 3.1 mm
Weight	1.9 g

1.4 Environmental conditions

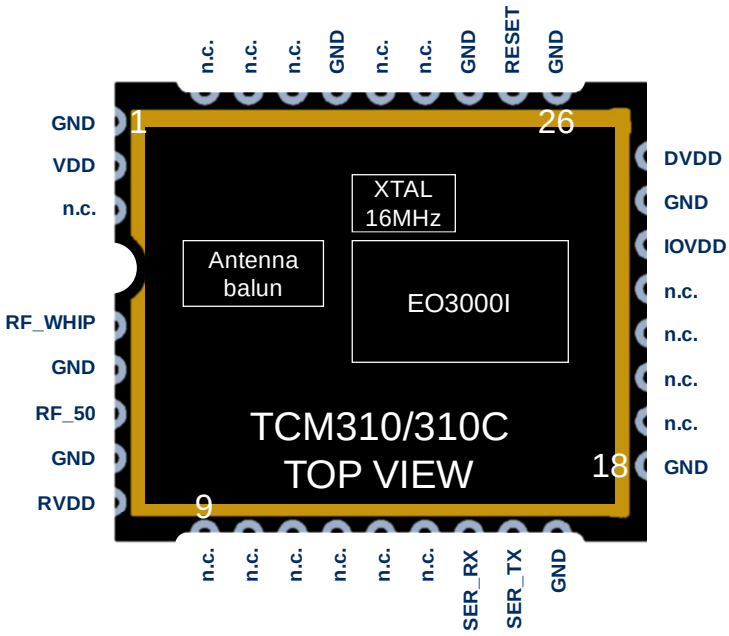
Operating temperature	-0 °C … +65 °C
Storage temperature	-40 °C … +85 °C
Storage temperature in tape & reel package	-20 °C … +50 °C
Humidity	0% … 93% r.H., non-condensing

1.5 Ordering information

Type	Ordering Code	Frequency
TCM 310	**S3003-K310**	**868.3 MHz**
TCM 310C	**S3033-K310**	**315.0 MHz**

2 FUNCTIONAL DESCRIPTION

2.1 Pin out



The figure above shows the pin out of the TCM 310 hardware.

2.2 Pin description and operational characteristics

HW Symbol	Function	Characteristics
GND	Ground connection	Must be connected to GND; see 3.4
VDD	Supply voltage	3.0 V +/-5%
RVDD	RF supply voltage regulator output	Leave open
DVDD	Digital supply voltage regulator output	1.8 V Output current: max. 5 mA
IOVDD	GPIO supply voltage	Must be connected to desired interface supply voltage (see 2.4) See also 2.2.1.
RESET	Reset input	External 10 kΩ pull-down required.
SER_RX	UART input	See 2.6
SER_TX	UART output	See 2.6
RF_WHIP	RF output	Output for whip antenna
RF_50	RF output	50 Ohm output for external antenna
n.c.	Not connected	Do not connect!

2.2.1 GPIO supply voltage - IOVDD

For digital communication with other circuitry the pins of the serial interface UART may be operated from supply voltages different from DVDD. Therefore an interface voltage supply pin IOVDD is available which can be connected either to DVDD or to an external supply within the tolerated voltage range of IOVDD.

If DVDD=0 V (e.g. in any sleep mode) and IOVDD is supplied, there may be unpredictable and varying current from IOVDD caused by internal floating nodes. It must be taken care that the current into IOVDD does not exceed 10 mA while DVDD=0 V. If DVDD=0 V and IOVDD is not supplied, do not apply voltage to any above mentioned pin. This may lead to unpredictable malfunction of the device.

IOVDD voltage must not exceed VDD voltage! A malfunction of the module may be caused by such inverse supply!

2.3 Absolute maximum ratings (non operating)

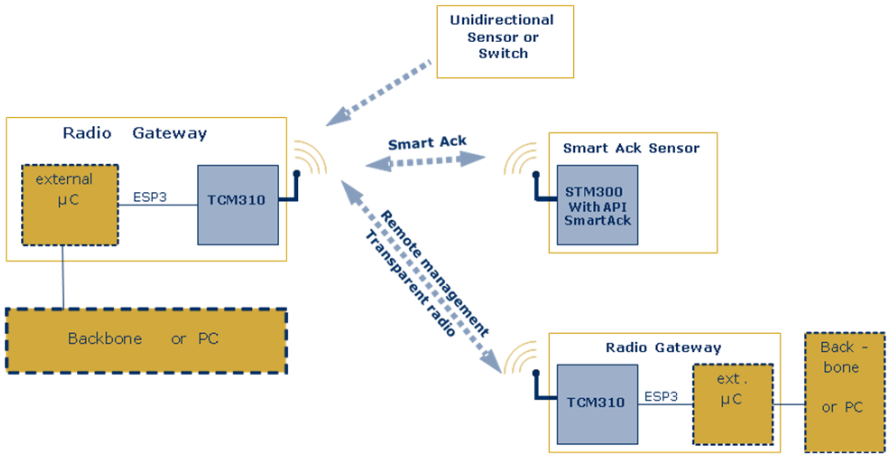
Symbol	Parameter	Min	Max	Units
VDD	Supply voltage at VDD	-0.5	5.5	V
IOVDD	GPIO supply voltage	-0.5	3.6	V
GND	Ground connection	0	0	V
VIND1	Voltage at RESET, and UART	-0.5	3.6	V

2.4 Maximum ratings (operating)

Symbol	Parameter	Min	Max	Units
VDD	Supply voltage at VDD TCM 310	2.85	3.15	V
IOVDD	GPIO supply voltage (see also 2.2.1)	1.7	VDD	V
GND	Ground connection	0	0	V
VIND1	Voltage at RESET, and UART	0	3.6	V
VDDR	Max. ripple at VDD		50	mVpp

2.5 System environment

In the figure below, TCM 310 is shown in a typical system environment.



2.6 Serial Interface

TCM 310 provides a bi-directional serial interface which conforms to the ESP3 specification. For details regarding ESP3 please refer to the ESP3 specification[2]. The data rate on the serial interface is 58.8 kbit/s which is usually interoperable with systems running at 57.6 kbit/s.

Direction	Nominal serial data rate	Tolerance
TX (sent by module)	58823 bit/s (=57600 bit/s + 2.1%)	< 50 ppm
RX (received by module)	58823 bit/s	< 5%

The following ESP3 commands are supported:

- Type 1 Radio command for transparent mode
- Type 2 Responses
- Type 4 Event
  - SA_CONFIRM_LEARN to confirm/discard learn in/out
  - CO_READY to indicate wake up from deep sleep initiated by CO_WR_SLEEP
- Type 5 Common commands
  - CO_WR_SLEEP to enter energy saving mode
  - CO_WR_RESET to reset the device
  - CO_RD_VERSION to read SW/HW versions, chip ID etc.
  - CO_RD_SYS_LOG to read system log from device data base
  - CO_WR_SYS_LOG to reset system log from device data base
  - CO_WR_BIST to perform flash BIST operation
  - CO_WR_IDBASE to write ID range base number
  - CO_RD_IDBASE to read ID range base number
  - CO_WR_REPEATER to configure repeater functionality
  - CO_RD_REPEATER to read repeater state
  - CO_WR_FILTER_ADD to add filter to filter list
  - CO_WR_FILTER_DEL to delete filter from filter list
  - CO_WR_FILTER_DEL_ALL to delete all filter
  - CO_WR_FILTER_ENABLE to enable/disable supplied filters
  - CO_RD_FILTER to read supplied filters
  - CO_WR_WAIT_MATURITY to wait maturity time before returning radio telegrams
  - CO_WR_MEM for writing into memory
  - CO_RD_MEM for reading memory
  - CO_RD_MEM_ADDRESS to get addresses of special areas
- Type 6 Smart Acknowledge commands
  - SA_WR_LEARNMODE to set/reset Smart Acknowledge learn mode
  - SA_RD_LEARNMODE to get learn mode
  - SA_WR_LEARNCONFIRM to add or delete a mailbox of a client
  - SA_WR_RESET to send a reset command to a client
  - SA_RD_LEARNEDCLIENTS to get learned mailboxes/clients
  - SA_WR_POSTMASTER to activate/deactivate post master functionality
- Type 7 Remote Management messages up to 256 Bytes

[2] http://www.enocean.com/en/enocean_modules/tcm-300/

2.7 Built-in Repeater

TCM 310 provides the option to activate a one or two-level repeater for EnOcean radio telegrams.
1-level repeater: If a received telegram is a valid and original (not yet repeated), the telegram is repeated after a random delay.
2-level repeater: If a received telegram is valid and original or repeated once, the telegram is repeated after a random delay.

2-level repeating function should only be activated if really needed! Otherwise the system function can be compromised by collisions of telegrams.

The repeated telegram is marked as "repeated" by an increased repeater counter. Configuration of the repeater is done via serial interface commands.

For detailed recommendations regarding the usage of repeaters please refer to our application note EnOcean Wireless Systems - Installation Notes (PDF), 09/2010.

2.8 Smart Acknowledge

TCM 310 provides a post master function with 15 mailboxes for sensors using Smart Ack technology. For more information on smart acknowledge please refer to EnOcean Equipment Profiles (EEP) V2.1.

When teaching-in a device using Smart Acknowledge please take care to switch off all TCM 3xy devices which are not continuously powered. Otherwise these TCM 3xy modules could be declared postmaster. As soon as the power supply is switched off, a postmaster would be missing and Smart Acknowledge would not work any longer!

2.9 Remote Management

TCM 310 provides a transparent radio channel also for remote management messages with a message length of up to 256 bytes. This enables an external micro controller connected to TCM 310 to handle remote management request from external devices or to control other devices via remote management. For more information on remote management please refer to EnOcean Equipment Profiles (EEP) V2.1.

3 APPLICATIONS INFORMATION

3.1 Transmission range

The main factors that influence the system transmission range are type and location of the antennas of the receiver and the transmitter, type of terrain and degree of obstruction of the link path, sources of interference affecting the receiver, and "dead" spots caused by signal reflections from nearby conductive objects. Since the expected transmission range strongly depends on this system conditions, range tests should categorically be performed before notification of a particular range that will be attainable by a certain application.

The following figures for expected transmission range are considered by using a PTM, a STM or a TCM radio transmitter device and the TCM radio receiver device with preinstalled whip antenna and may be used as a rough guide only:

- Line-of-sight connections: Typically 30 m range in corridors, up to 100 m in halls
- Plasterboard walls / dry wood: Typically 30 m range, through max. 5 walls
- Line-of-sight connections: Typically 30 m range in corridors, up to 100 m in halls
- Ferro concrete walls / ceilings: Typically 10 m range, through max. 1 ceiling
- Fire-safety walls, elevator shafts, staircases and supply areas should be considered as screening.

The angle at which the transmitted signal hits the wall is very important. The effective wall thickness – and with it the signal attenuation – varies according to this angle. Signals should be transmitted as directly as possible through the wall. Wall niches should be avoided. Other factors restricting transmission range:

- Switch mounted on metal surfaces (up to 30% loss of transmission range)
- Hollow lightweight walls filled with insulating wool on metal foil
- False ceilings with panels of metal or carbon fibre
- Lead glass or glass with metal coating, steel furniture

The distance between EnOcean receivers and other transmitting devices such as computers, audio and video equipment that also emit high-frequency signals should be at least 0.5 m

A summarized application note to determine the transmission range within buildings is available as download from www.enocean.com.

3.2 Antenna options

3.2.1 Overview

Several antenna types have been investigated by EnOcean. They all have advantages and disadvantages as shown in the following table.

Advantages	Disadvantages
Whip Antenna (15 cm @ 315 MHz, 8.6 cm @ 868 MHz)	
Cheap	Automatic placement difficult
Omni directional	Bending influences performance
	Large size
Chip Antenna (AMD1103-ST01 @ 315 MHz/868 MHz)	
Omni directional	Expensive
Small size	Very sensitive to environment (GND plane, components), minimum distance space to other components needed
Automatic placement possible	
Splatch Antenna (ANT-315-SP1 @ 315 MHz, ANT-868-SP1 @ 868 MHz)	
Omni directional	Expensive
Not very sensitive to environment, low distance space to other components required	Large size
Automatic placement possible	
Helical Antenna (ANT-315-HE @ 315 MHz)	
Omni directional	Large distance space to other components required
Cheap	Large size (3D)

868 MHz modules used in Europe do not need additional approval if the external antenna fulfils the following requirements:

Antenna type	Passive	Mandatory for radio approval
Frequency band	868 MHz ISM	Antenna must be suited for this band
Impedance	~50 Ohm	Mandatory for radio approval
Maximum gain	≤ 0 dBi	Mandatory for radio approval
VSWR	≤ 1.5:1	Important for compatibility with EnOcean protocol
Return Loss	> 14 dB	Important for compatibility with EnOcean protocol
Bandwidth	≤ 20 MHz	Important if 10 V/m EMI robustness required for device

For 315 MHz modules please note that a full approval is needed if modules are used with antennas other than the specified whip antenna.

3.2.2 Whip antenna

315 MHz

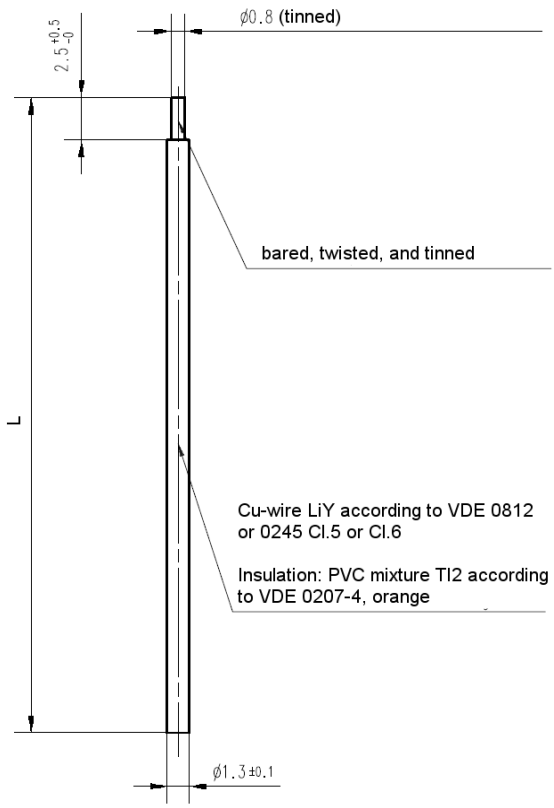
Antenna: 150 mm wire, connect to RF_WHIP

Minimum GND plane: 50 mm x 50 mm
Minimum distance space: 10 mm

868 MHz

Antenna: 86 mm wire, connect to RF_WHIP

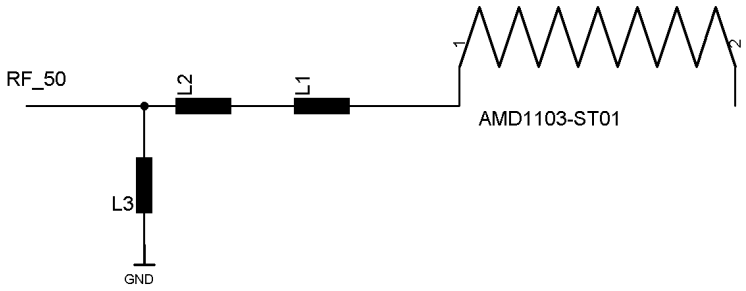
Minimum GND plane: 38 mm x 18 mm
Minimum distance space: 10 mm



Specification of the whip antenna; L=150 mm @ 315 MHz, L=86 mm @ 868 MHz

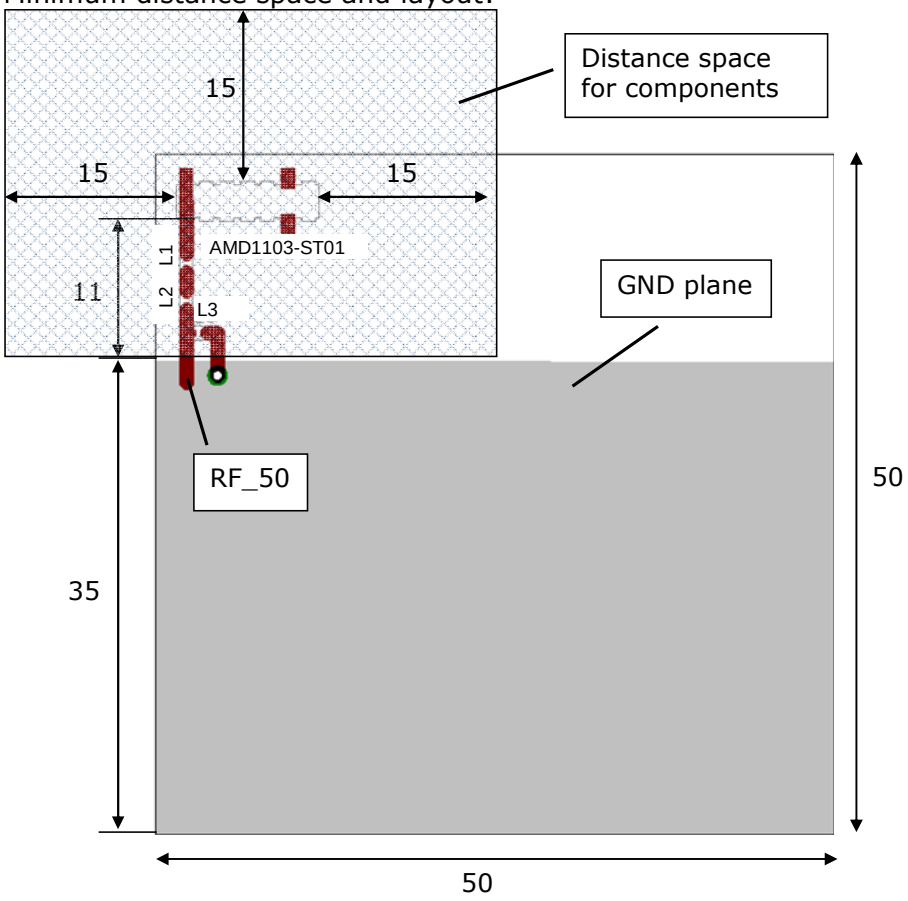
3.2.3 Chip antenna

315 MHz
Antenna: AMD1103-ST01
Manufacturer: Mitsubishi
Matching circuit:



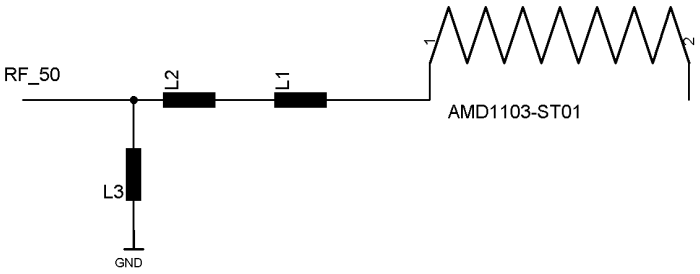
L1=47 nH
L2=390 nH
L3 optional for additional optimization

Minimum distance space and layout:



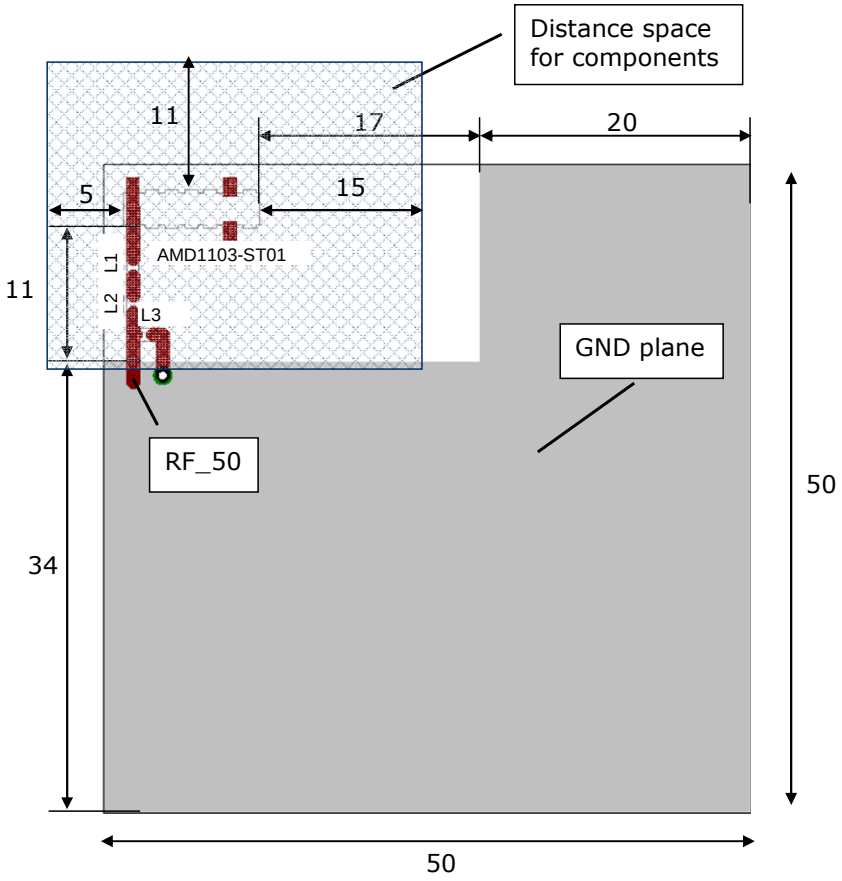
Minimum distance space above and below PCB: 11 mm

868 MHz
Antenna: AMD1103-ST01
Manufacturer: Mitsubishi
Matching circuit:



L1=6.8 nH
L2=39 nH
L3=8.2 nH

Minimum distance space, PCB properties and layout:
PCB Material: FR4, t_{Cu}=35 µm, h_{PCB}=1.5 mm, RF_50 micro strip width = 2.7 mm, if these parameters cannot be hold, then new matching values are required.

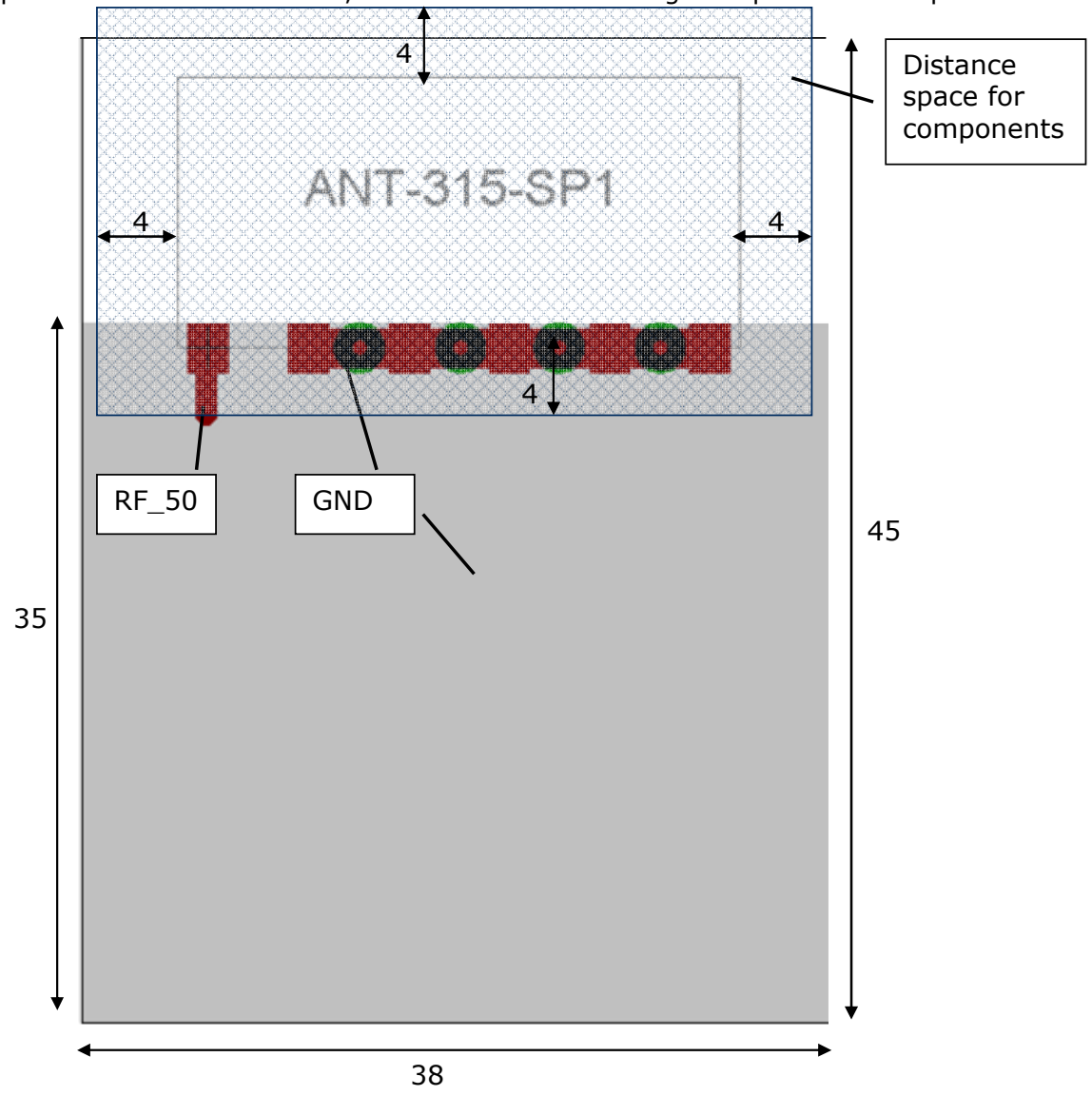


Minimum distance space above and below PCB: 11 mm

3.2.4 Splatch antenna

315/868 MHz

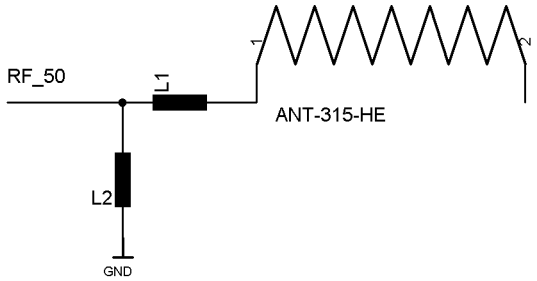
Antenna: ANT-315-SP
Manufacturer: Linx Technologies / Antenna Factor
Matching circuit: Not needed
Minimum distance space, PCB properties and layout:
PCB Material: FR4, t_{Cu}=35 µm, h_{PCB}=1.5 mm, RF_50 micro strip width = 2.7 mm if these parameters cannot be hold, then additional matching is required see chapter 3.5.3.



Minimum distance space above and below PCB: 12 mm

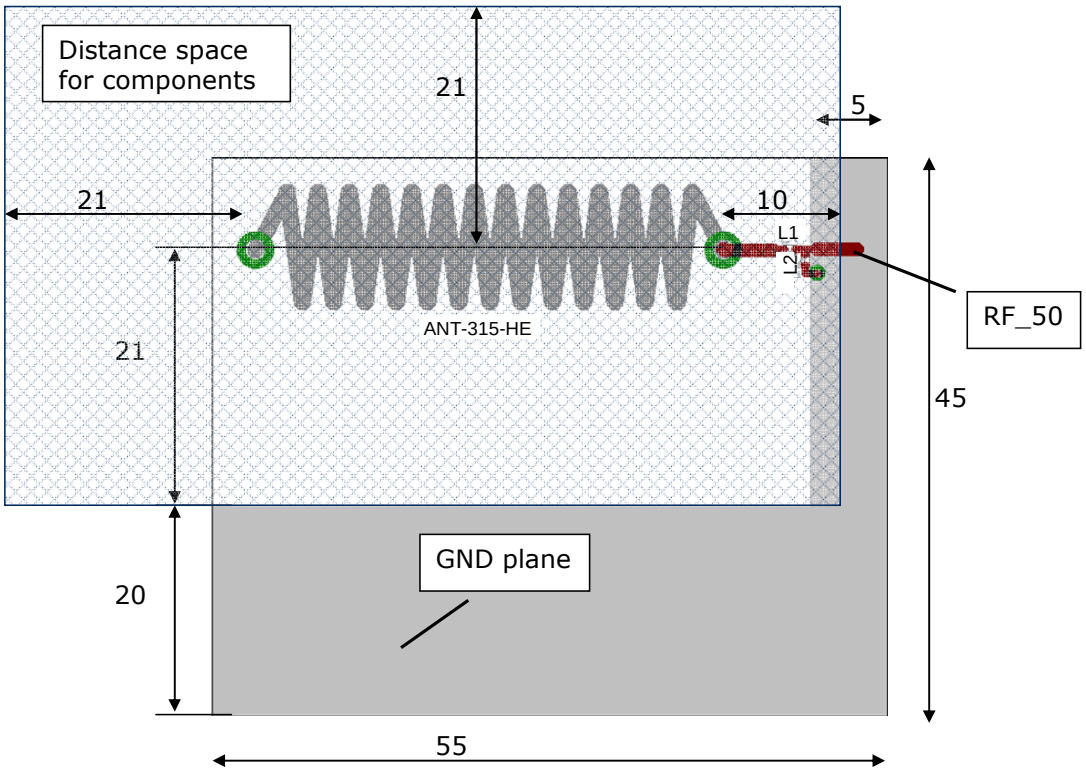
3.2.5 Helical antenna

315 MHz
Antenna: ANT-315-HE
Manufacturer: Linx Technologies / Antenna Factor
Matching circuit:



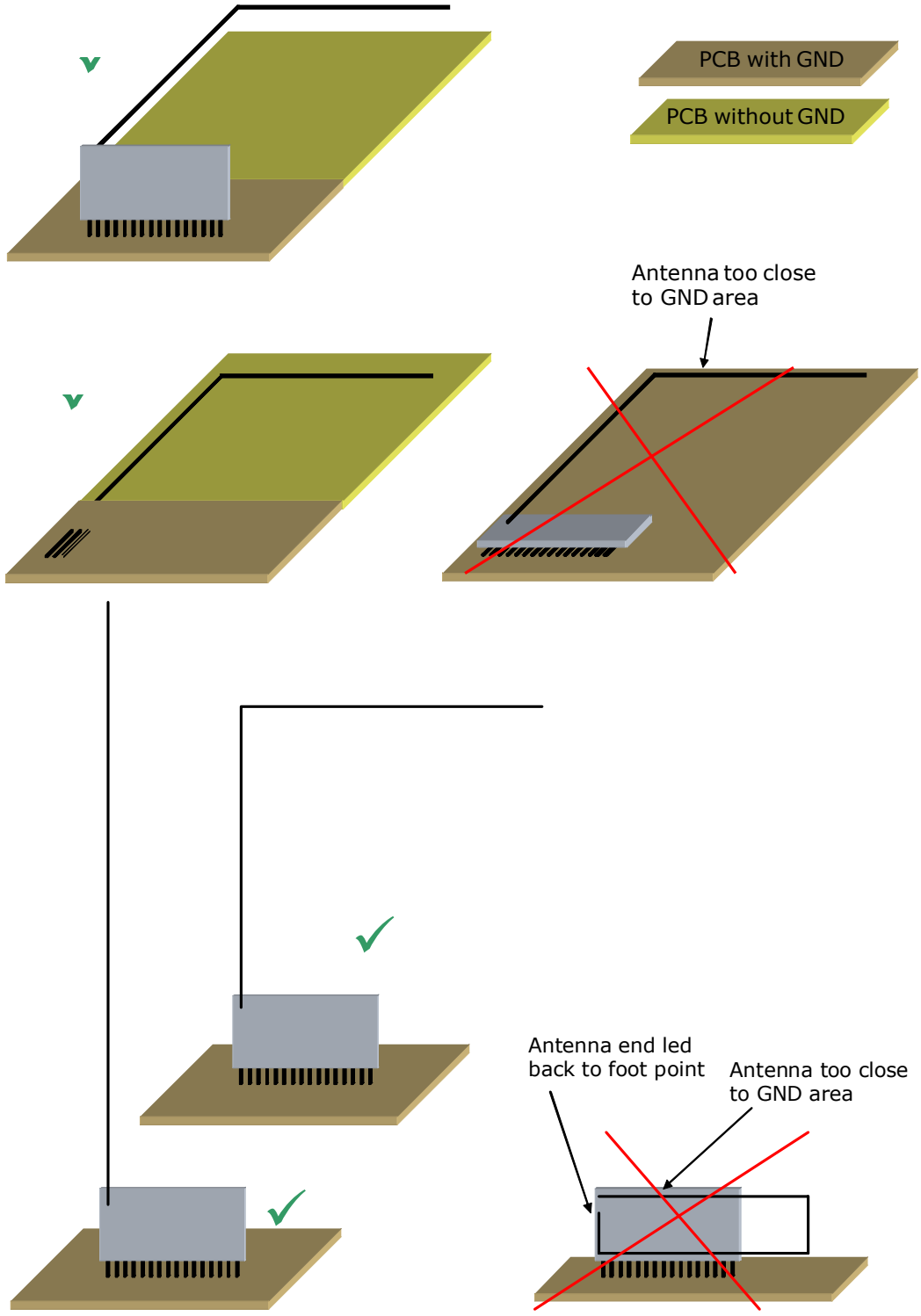
L1=5,1 nH
L2=18 nH

Minimum distance space and layout:



Minimum distance above and below axis of antenna: 21 mm

3.3 Recommendations for laying a whip antenna



3.4 Power supply requirements

In order to provide a good radio performance, great attention must be paid to the power supply and a correct layout and shielding. It is recommended to place a 22 µF ceramic capacitor between VDD and GND close to the module (material: X5R, X7R, min 6.3 V to avoid derating effects). In addition a 470 nH coil shall be inserted (Murata LQW18A, 0603) in the power supply line.

For best performance it is recommended to keep the ripple on the power supply rail below 10 mVpp (see 2.4).

All GND pins must be connected to GND. Be careful not to create loops! The ground must be realized ideally on both sides of the PCB board with many vias. At least there must be a short star connection. Otherwise RF performance can be reduced!

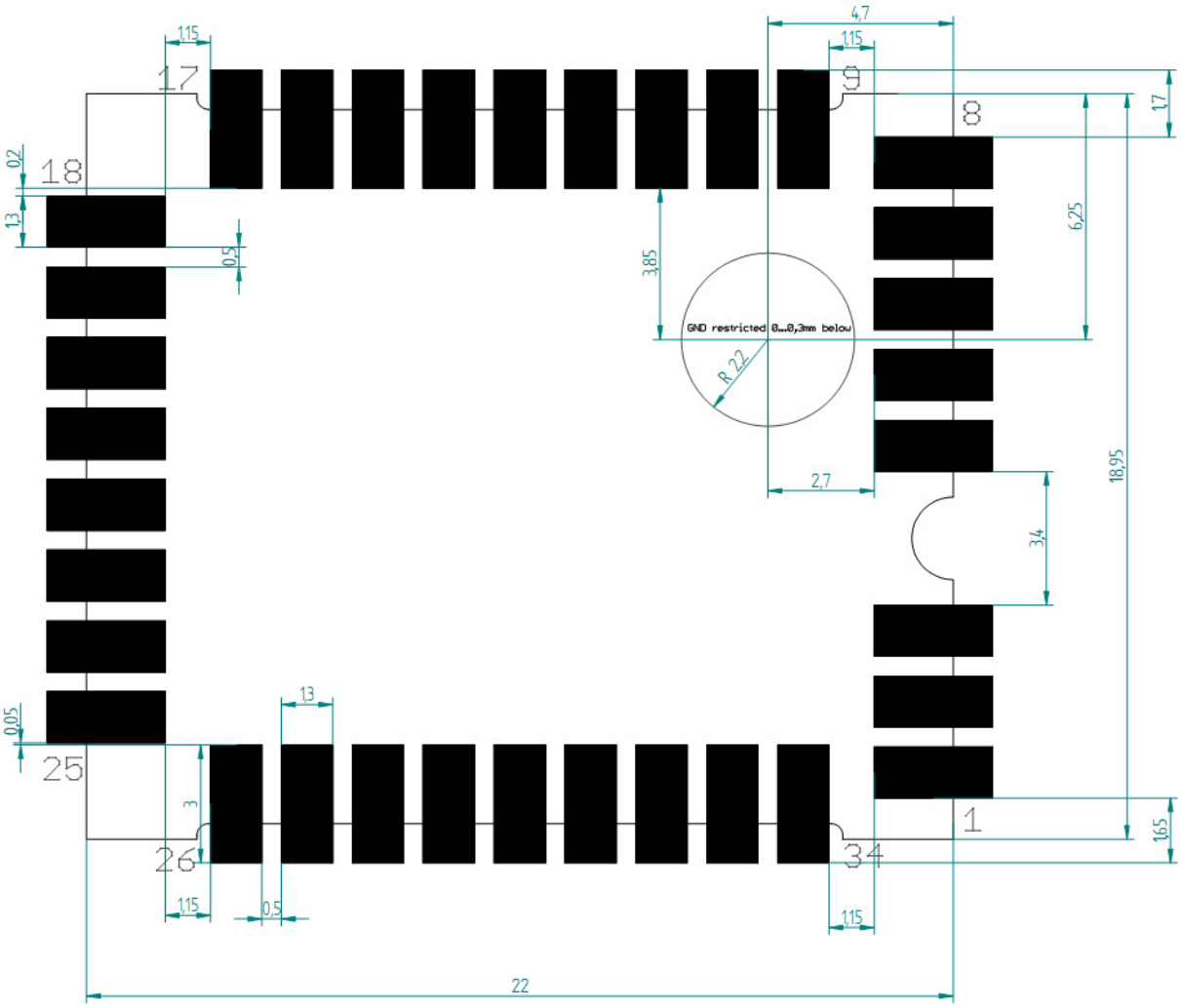
3.5 Layout recommendations

The length of lines connected to I/Os should not exceed 5 cm.

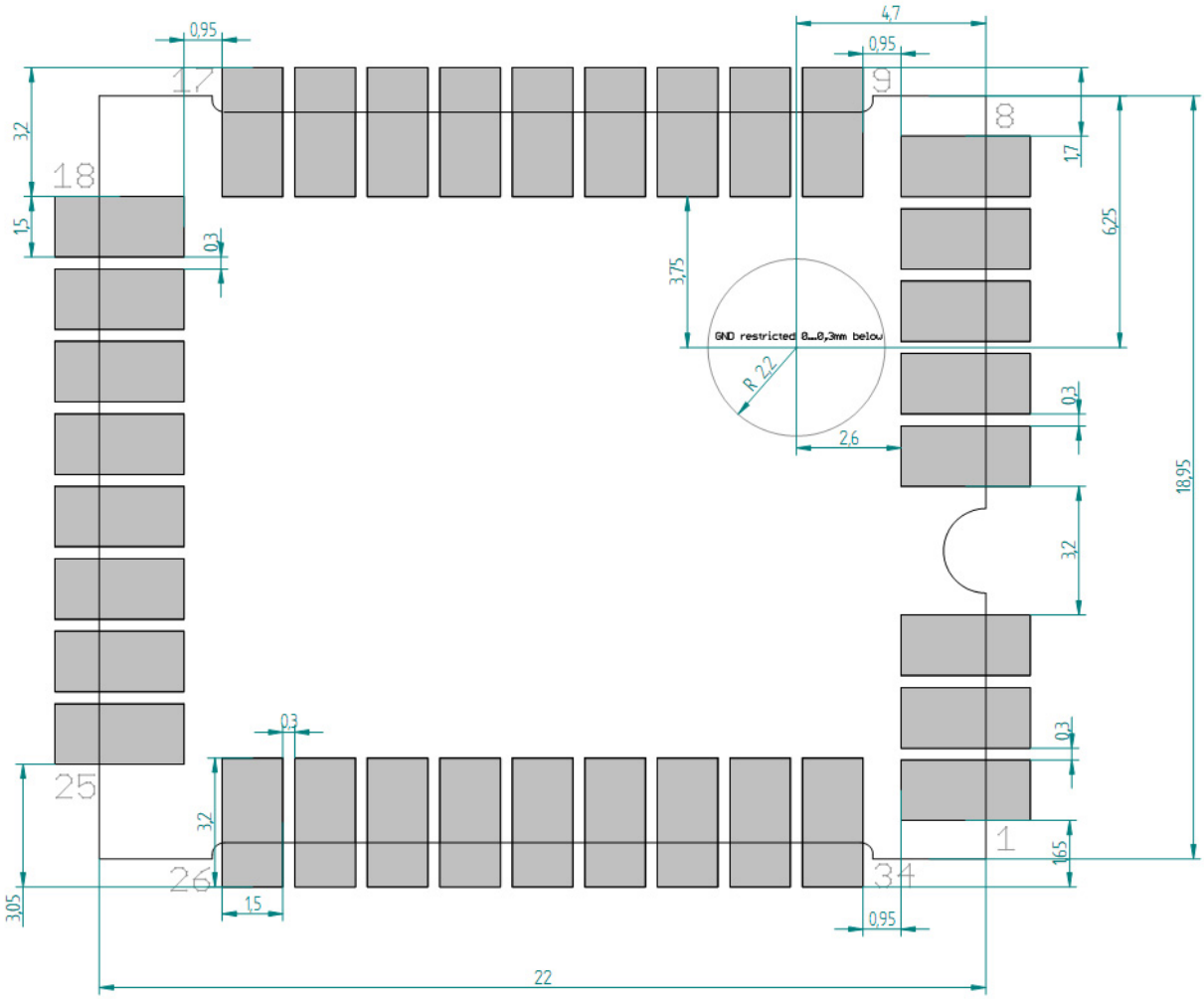
It is recommended to have a complete GND layer, at least below the module and directly connected components. GND must however be avoided 0…0.3mm below the PCB in the area marked by the circle in the figures below.

3.5.1 Recommended foot pattern

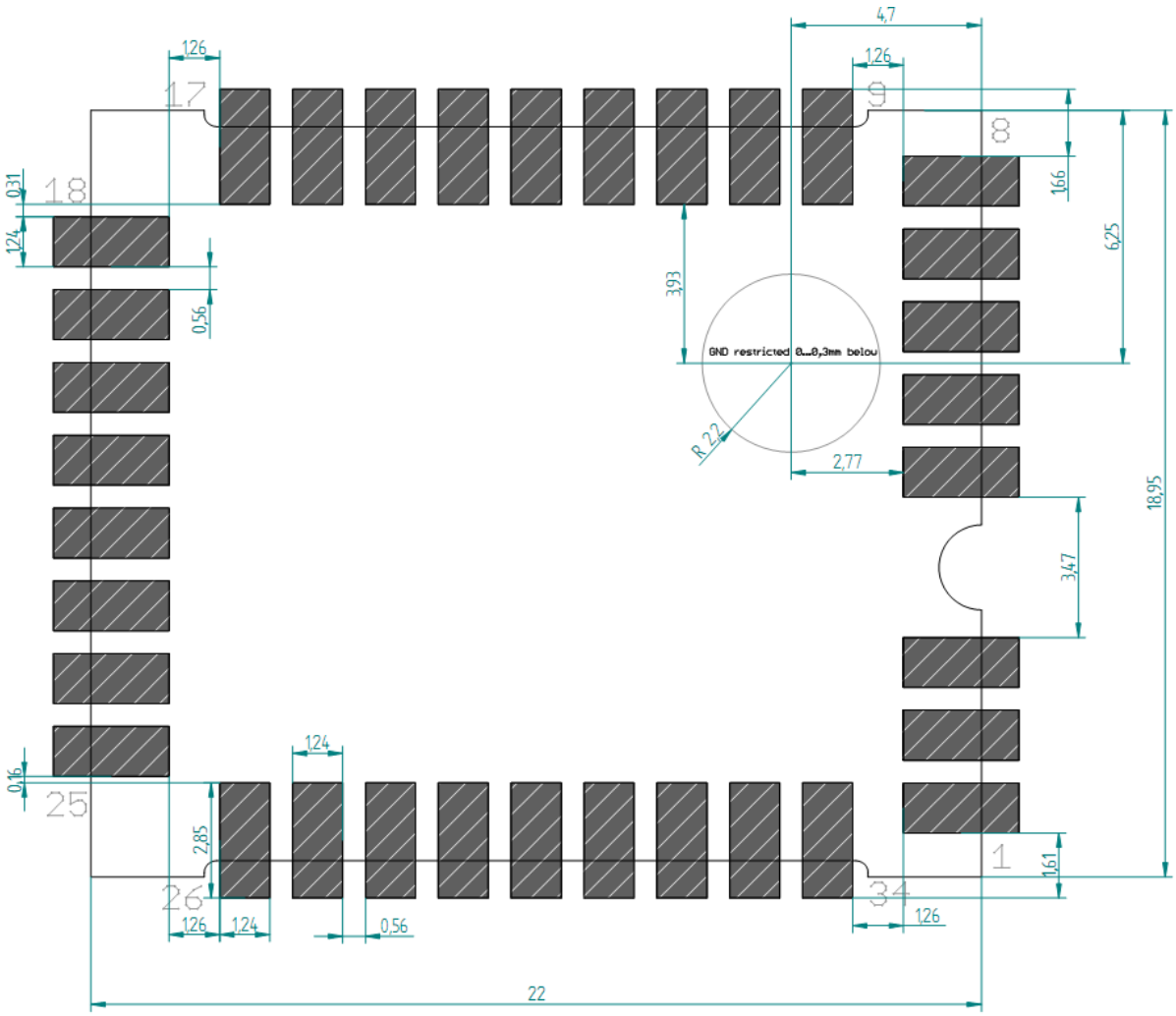
Top layer



Solder resist top layer



Solder paste top layer



The data above is also available as EAGLE library.

In order to ensure good solder quality a solder mask thickness of 150 µm is recommended.

In case a 120 µm solder mask is used, it is recommended to enlarge the solder print. The pads on the solder print should then be 0.1 mm larger than the pad dimensions of the module as specified in chapter 1.3. (not relative to the above drawing).

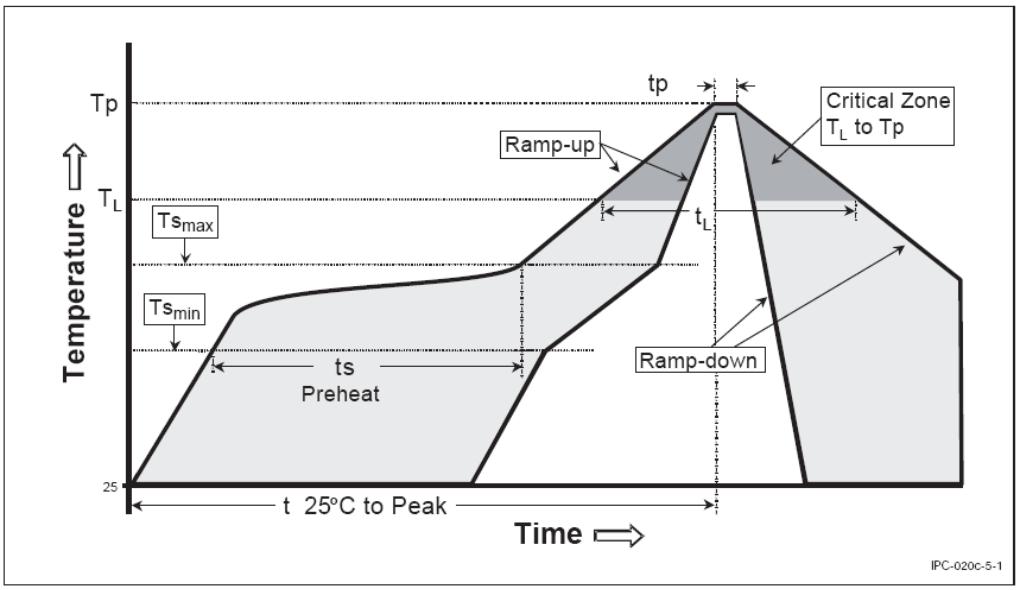
Nevertheless an application and production specific test regarding the amount of soldering paste should be performed to find optimum parameters.

3.6 Soldering information

TCM 310 has to be soldered according to IPC/JEDEC J-STD-020C standard.

Profile Feature	Pb-Free Assembly
Average Ramp-Up Rate (Ts_{max} to Tp)	3° C/second max.
Preheat – Temperature Min (Ts_{min}) – Temperature Max (Ts_{max}) – Time (ts_{min} to ts_{max})	150 °C 200 °C 60-180 seconds
Time maintained above: – Temperature (T_L) – Time (t_L)	217 °C 60-150 seconds
Peak/Classification Temperature (Tp)	260 °C
Time within 5 °C of actual Peak Temperature (tp)	20-40 seconds
Ramp-Down Rate	6 °C/second max.
Time 25 °C to Peak Temperature	8 minutes max.

Note 1: All temperatures refer to topside of the package, measured on the package body surface.



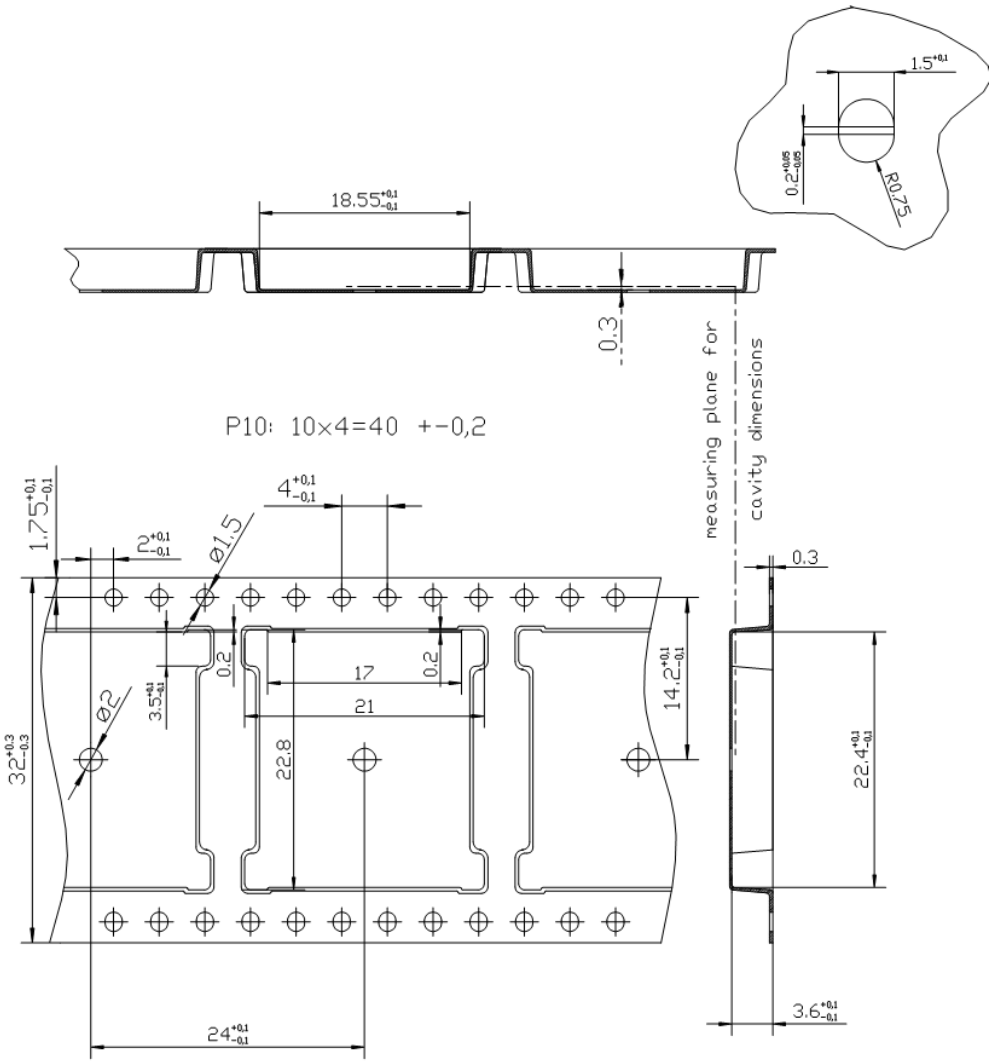
TCM 310 shall be handled according to Moisture Sensitivity Level MSL4 which means a floor time of 72 h. TCM 310 may be soldered only once, since one time is already consumed at production of the module itself.

Once the dry pack bag is opened, the desired quantity of units should be removed and the bag resealed within two hours. If the bag is left open longer than 30 minutes the desiccant should be replaced with dry desiccant. If devices have exceeded the specified floor life time of 72 h, they may be baked according IPC/JEDEC J-STD-033B at max. 90°C for less than 60 h.

Devices packaged in moisture-proof packaging should be stored in ambient conditions not exceeding temperatures of 40 °C or humidity levels of 90% r.H.

TCM 310 modules have to be soldered within 6 months after delivery!

3.7 Tape & Reel specification



Tape running direction

4 AGENCY CERTIFICATIONS

The modules have been tested to fulfil the approval requirements for CE (TCM 310) and FCC/IC (TCM 310C) based on the built-in firmware.

When developing customer specific firmware based on the API for this module, special care must be taken not to exceed the specified regulatory limits, e.g. the duty cycle limitations!

4.1 CE approval

The modules bear the EC conformity marking CE and conform to the R&TTE EU-directive on radio equipment. The assembly conforms to the European and national requirements of electromagnetic compatibility. The conformity has been proven and the according documentation has been deposited at EnOcean. The modules can be operated without notification and free of charge in the area of the European Union, and in Switzerland. The following provisos apply:

- EnOcean RF modules must not be modified or used outside their specification limits.
- EnOcean RF modules may only be used to transfer digital or digitized data. Analog speech and/or music are not permitted.

- The final product incorporating EnOcean RF modules must itself meet the essential requirement of the R&TTE Directive and a CE marking must be affixed on the final product and on the sales packaging each. Operating instructions containing a Declaration of Conformity has to be attached.
- If the transmitter is used according to the regulations of the 868.3 MHz band, a so-called "Duty Cycle" of 1% per hour must not be exceeded. Permanent transmitters such as radio earphones are not allowed.
- The module must be used with only the following approved antenna(s).

Type	Parameter	Value
Wire/Monopole at RF_WHIP	Maximum gain	1.0 dBi
External antenna at RF_50	Antenna type	Passive
	Impedance	~50 Ohm
	Maximum gain	≤ 0 dBi

4.2 FCC (United States) Certification

LIMITED MODULAR APPROVAL

This is an RF module approved for Limited Modular use operating as an intentional transmitting device with respect to 47 CFR 15.231(a-c) and is limited to OEM installation. The module is optimized to operate using small amounts of energy, and may be powered by a battery. The module transmits short radio packets comprised of control signals, (in some cases the control signal may be accompanied with data) such as those used with alarm systems, door openers, remote switches, and the like. The module does not support continuous streaming of voice, video, or any other forms of streaming data; it sends only short packets containing control signals and possibly data. The module is designed to comply with, has been tested according to 15.231(a-c), and has been found to comply with each requirement. Thus, a finished device containing the TCM 310C radio module can be operated in the United States without additional Part 15 FCC approval (approval(s) for unintentional radiators may be required for the OEM's finished product), under EnOcean's FCC ID number. This greatly simplifies and shortens the design cycle and development costs for OEM integrators. The module can be triggered manually or automatically, which cases are described below.

Manual Activation

The radio module can be configured to transmit a short packetized control signal if triggered manually. The module can be triggered, by pressing a switch, for example.
The packet contains one (or more) control signals that is (are) intended to control something at the receiving end. The packet may also contain data. Depending on how much energy is available from the energy source, subsequent manual triggers can initiate the transmission of additional control signals. This may be necessary if prior packet(s) was (were) lost to fading or interference. Subsequent triggers can also be initiated as a precaution if any doubt exists that the first packet didn't arrive at the receiver. Each packet that is transmitted, regardless of whether it was the first one or a subsequent one, will only be transmitted if enough energy is available from the energy source.

Automatic Activation

The radio module also can be configured to transmit a short packetized control signal, if triggered automatically, by a relevant change of its inputs or in response to receiving a signal from another transmitter, for example. Again, the packet contains a control signal that is intended to control something at the receiving end and may also contain data. As above, it is possible for the packet to get lost and never reach the receiver. However, if enough energy is available from the energy source, and the module has been configured to do so, then another packet or packets containing the control signal may be transmitted at a later time.

The device is capable to operate as a repeater, which can receive signals from the following list of FCC/IC approved transmitters, and retransmit the signals.

PTM 200C	FCC ID:SZV-PTM200C	IC:5713A-PTM200C
STM 110C	FCC ID:SZV-STM110C	IC:5713A-STM110C
TCM 200C	FCC ID:SZV-TCM2XXC	IC:5713A-TCM2XXC
TCM 220C	FCC ID:SZV-TCM2XXC	IC:5713A-TCM2XXC
TCM 300C	FCC ID:SZV-STM300C	IC:5713A-STM300C
TCM 310C	FCC ID:SZV-STM300C	IC:5713A-STM300C
STM 300C	FCC ID:SZV-STM300C	IC:5713A-STM300C
TCM 320C	FCC ID:SZV-TCM320C	IC:5713A-TCM320C

OEM Requirements
In order to use EnOcean's FCC ID number, the OEM must ensure that the following conditions are met:

- End users of products, which contain the module, must not have the ability to alter the firmware that governs the operation of the module. The agency grant is valid only when the module is incorporated into a final product by OEM integrators.
- The end-user must not be provided with instructions to remove, adjust or install the module.
- The Original Equipment Manufacturer (OEM) must ensure that FCC labeling requirements are met. This includes a clearly visible label on the outside of the final product. Attaching a label to a removable portion of the final product, such as a battery cover, is not permitted. The label must include the following text:

  Contains FCC ID: SZV-STM300C
  The enclosed device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (i.) this device may not cause harmful interference and (ii.) this device must accept any interference received, including interference that may cause undesired operation.

  When the device is so small or for such use that it is not practicable to place the statement above on it, the information required by this paragraph shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed. However, the FCC identifier or the unique identifier, as appropriate, must be displayed on the device.

  The user manual for the end product must also contain the text given above.
- Changes or modifications not expressly approved by EnOcean could void the user's authority to operate the equipment.
- The module must be used with only the following approved antenna(s).

Part Number	Type	Gain
N.A.	Wire/Monopole	1.0 dBi

- The OEM must ensure that timing requirements according to 47 CFR 15.231(a-c) are met.
- The OEM must sign the OEM Limited Modular Approval Agreement with EnOcean

TCB **GRANT OF EQUIPMENT AUTHORIZATION** **TCB**

Certification
Issued Under the Authority of the
Federal Communications Commission
By:

PHOENIX TESTLAB GmbH
Koenigswinkel 10
D-32825 Blomberg,
Germany

Date of Grant: 04/07/2010

Application Dated: 04/07/2010

EnOcean GmbH
Kolpingring 18a
Oberhaching, 82041
Germany

Attention: Armin Anders , Director Product Marketing

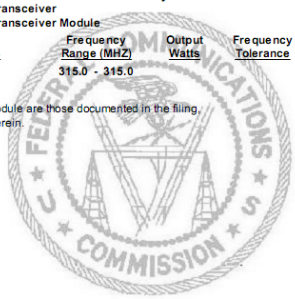
NOT TRANSFERABLE

EQUIPMENT AUTHORIZATION is hereby issued to the named GRANTEE, and is VALID ONLY for the equipment identified hereon for use under the Commission's Rules and Regulations listed below.

FCC IDENTIFIER: SZV-STM300C
Name of Grantee: EnOcean GmbH
Equipment Class: Part 15 Remote Control/Security Device Transceiver
Notes: Transceiver Module

Grant Notes	FCC Rule Parts	Frequency Range (MHZ)	Output Watts	Frequency Tolerance	Emission Designator
	15.231	315.0 - 315.0			

The only antennas approved for use with this module are those documented in the filing, and must be installed in the manner specified therein.



4.3 IC (Industry Canada) Certification

In order to use EnOcean's IC number, the OEM must ensure that the following conditions are met:

- Labeling requirements for Industry Canada are similar to those required by the FCC. The Original Equipment Manufacturer (OEM) must ensure that IC labeling requirements are met. A clearly visible label on the outside of a non-removable part of the final product must include the following text:

  Contains IC: 5713A-STM300C

- The OEM must sign the OEM Limited Modular Approval Agreement with EnOcean

PHOENIX TESTLAB

TECHNICAL APPROVAL CERTIFICATE
based on the Agreement on Mutual Recognition between the European Community and Canada

CERTIFICAT D'APPROBATION TECHNIQUE
en se basant l'accord de reconnaissance mutuelle entre la Communauté Européenne et le Canada

CERTIFICATE NUMBER *NUMÉRO DE CERTIFICAT*	**10-110676**
CERTIFICATION NUMBER *NUMÉRO DE CERTIFICATION*	**IC: 5713A-STM300C**
TYPE OF SERVICE *TYPE DE SERVICE*	**NEW FAMILY CERTIFICATION / LIMITED MODULAR APPROVAL**
CERTIFICATE HOLDER *TITULAIRE DU CERTIFICAT*	**EnOcean GmbH Kolpingring 18a 82041 Oberhaching Germany**
TYPE OF EQUIPMENT *GENRE DE MATÉRIEL*	**Transceiver Module**
TRADE NAME AND MODEL NUMBER *MARQUE ET NUMÉRO DE MODÈLE*	**EnOcean** **TCM300C / STM300C**
FREQUENCY RANGE *BANDE DE FRÉQUENCES*	**315MHz**
EMISSION DESIGNATION (TRC-43) *DÉSIGNATION D'ÉMISSION (CRT-43)*	**373KA1D**
R.F. POWER RATING (WATT) *PUISSANCE NOMINALE H.F (WATT)*	/
ANTENNA INFORMATION *INFORMATION D'ANTENNE*	**Wire Antenna 15cm**
CONTACT INFORMATION OF TESTING LABORATORY *COORDONNÉES DU LABORATOIRE D'ESSAI*	**Pkm electronic GmbH Ohmstrasse 1 84160 Frontenhausen Germany**
CERTIFIED TO / SPECIFICATION / ISSUE *CERTIFIÉ SELON LE / CAHIER DES CHARGES / ÉDITION*	**RSS-210 Issue 7, RSS-GEN Issue 2 RSS-102 Issue 4**

Certification of equipment means only that the equipment has met the requirements of the above noted specification. License applications, where applicable to use certified equipment, are acted on accordingly by the issuing office and will depend on the existing radio environment, service and location of operation. This certificate is issued on condition that the holder complies and will continue to comply with the requirements of the radio standards specifications and procedures issued by the Department.

La certification du matériel signifie seulement que le matériel a satisfait aux exigences de la norme indiquée ci-dessus. Les demandes de licences nécessaires pour l'utilisation du matériel certifié sont traitées en conséquence par le bureau de délivrance et dépendent des conditions radio ambiantes, du service et de l'emplacement d'exploitation. Le présent certificat est délivré à la condition que le titulaire satisfasse et continue de satisfaire aux exigences aux procédures d' Industry Canada.

Labelling of Certified Radio Equipment: Equipment that has received certification but is not labelled with the applicant's name, model number and the certification number as outlined above is not considered certified.

Étiquetage du matériel radio homologué: Le matériel pour lequel une certification a été obtenue mais qui n'est pas étiqueté conformément aux exigences ci-dessus (nom du requérant, numéro de modèle et numéro de certification) n'est pas considéré comme certifié.

Certification Body Code: DE0003 recognised by Bundesnetzagentur BNetzA-CAB-04/22-53

Signed by / *Signataire* Uwe Dollitz

Blomberg, 07 April 2010 Foreign Certification Body (FCB)

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